PATENT SPECIFICATION 741,186

Inventor:—CYRIL EMANUEL GILES.

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COMPLETE SPECIFICATION.

Improvements in or relating to Circular and other Saws.

We, ELSWORTH LIMITED, a British Company, of Herries Road South, Sheffield 6, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to saws of the type in which the cutting edges proper of the teeth are provided by hard metal bonded to the steel body material.

It is known to form recesses in the front face, or the top (rear) face, or in one or both of the side faces, of some or all of the teeth of a circular saw, and to fill each recess with an insert of "hardmetal", such as a pre-formed sintered compact of tungsten carbide brazed or welded into position; also to apply similarly pre-formed compacts in the form of tooth segments by welding or brazing them to the periphery of a circular saw body. Fusion-deposition of a substantially non-ferrous hard metal alloy of metals such as cobalt, chromium, and tungsten is also known for the tipping of saw teeth by deposition on one side of a previously "set" saw-tooth, followed by removal of both the parent metal and some of the deposit to remove the set, after which final re-setting provides a composite tooth with the deposit on one side and the parent metal on the other the deposit being only of the full width of the tooth at the tip of the tooth.

It is also known to cast high speed or tool steel on to or into the edge of a saw body material such as low carbon steel, but the hardness of the resultant teeth is not to be compared with that of "hard metals" such as tungsten carbide or of non-ferrous hard metal alloys of the type mentioned above.

The object of the present invention is to provide a circular or other saw with teeth having "hard metal" or hard metal alloy providing the whole of the cutting edges in both the front and top (rear) faces of the teeth.

According to the present invention, a circular or other saw has some at least of its teeth provided with a substantially triangular cutting tip formed by "hard metal" such as tungsten carbide or substantially non-ferrous hard metal alloy of metals such as cobalt, chromium, and tungsten, as a fusion-deposit applied by welding to the steel body of the saw, the "hard metal" or hard metal alloy constituting the whole thickness of the tooth for a substantial distance along both the front face and the top face of the tooth from its tip.

The invention is applicable to circular saws, band saws, and long saws having a very wide variety of sizes and shapes of teeth, in accordance with the purpose to which any particular saw is to be put; likewise, the available "hard metals" and hard metal alloys enable a wide selection to be made for the type of fusion-deposit, in accordance with the purpose of the saw.

The third face (not necessarily straight) of the "triangle" of hard metal tip in each tooth may occupy such position intermediately of the tip radius and the root radius as to leave a sufficient stub of steel body material completing the remainder of the tooth for setting of the tooth by deformation of the stub. The rear end of the third face in such case is advantageously nearer the tip line of the saw than is the front end, i.e., in the case of a circular saw, farther from the centre of the saw than is the front end, so as to provide an oblique face for the transmission of thrust between the triangular tip and the stub of the tooth. The cutting tips may be finished to equal in thickness the thickness of the body, so that when the saw is set it closely

resembles a similar set saw made wholly of tool steel.

Such a circular or other saw as just described, and having its fusion-deposited cutting tips of a hard metal alloy of the type mentioned above is particularly useful for sawing woods of intermediate hardness and woods from sources likely to introduce sand into them, because it not only has a long total life, but may also be readily re-ground by the method employed for tool-steel saws by users of such woods. It is much less expensive than a saw having pre-formed sintered compact inserts, which, moreover, do not lend themselves to re-grinding by methods ordinarily available to such users.

It is not essential to provide the set on the saw by deformation of the stub of the tooth: the cutting tips may be finished to shape out of the plane of the body to provide the set, for example with successive teeth set to opposite sides of the body, Again, the tip may project to one or both sides beyond the side plane or planes of the body and be finished by "hollow grinding" the side or sides of the teeth and the sides of the body to make the overall thickness at the tooth tips (i.e. the peripheral thickness in the case of a circular saw) greater than the body thickness. Moreover, the sides of cutting tips projecting beyond a side plane of the body may be relieved behind their front faces, e.g. when the saw is used for grooving.

The body is initially formed with only the stubs projecting at its edge (i.e. periphery, in the case of a circular saw), ready for the deposition of the tips on the outer faces of the stubs forming the bonding surfaces.

The fusion-deposited cutting tip may even form the whole of a tooth, the bonding surfaces then being at the edge of the body, i.e. at the periphery of a simple circular body in the case of a circular saw. The whole-tooth cutting tip may then be shaped to give the set, or hollow-ground down to the body, as described above. This form of tooth is particularly suitable for relatively finely toothed saws.

As an extension of this whole-toothed bonding of a fusion-deposited cutting tip, fine teeth may be applied by depositing the "hard metal" or hard metal alloy continuously along the edge of the body, e.g. round the complete periphery of a circular steel body and subsequently forming the toothed profile in the deposit. The initial width or radial dimension of the deposit should be greater than the tooth depth, to allow for repeated re-grinding. In this case, hollow-grinding is preferred to make the overall tip thickness greater than the body thickness; but setting of the teeth by grinding their side faces individually may also be adopted.

Although for softwoods and medium hardwoods, hard metal alloys of the type mentioned above suffice for the teeth of saws as required by the generality of users, with the advantages in prime cost and ease of grinding mentioned above, teeth formed by fusion-deposition of tungsten carbide or like hard particles in a ferrous matrix, to be initially shaped and subsequently re-ground by the use of appropriately hard abrasives, may be used for harder and more difficult timbers, as well as on plastics and plastic-bonded laminated material, but they are more difficult to re-sharpen than saws with teeth of hard metal alloy.

The fusion-deposition may be effected by acetylene welding or by electro-welding, as appropriate for the hard materials required to be deposited.

The invention will now be described in greater detail with reference to the accompanying drawings, in which:—

Figure 1 is an elevation of a portion of the toothed circumference of a circular saw with one form of cutting tip according to the invention;

Figure 2 is a plan view of Figure 1;

Figure 3 is a section on the line 3—3 of Figure 1;

Figure 4 is a section showing a modified form of cutting tip and set;

Figure 5 is a section of a further modified form of cutting tip;

Figure 6 is an elevation of a portion of the toothed circumference of a circular saw with a further modified form of cutting tip;

Figure 7 is an elevation of a portion of the toothed circumference of a circular saw with a continuous deposit in which the teeth are formed;

Figure 8 shows sections of alternate teeth with another form of set; and

Figures 9 to 12 correspond to Figures 1, 2, 6 and 7 but show the application of the invention to long saws and band saws.

In Figures 1 to 3, a circular saw body 1 is provided with tooth stubs 2 ending in faces 3 formed obliquely so that the rear end 4 is farther from the saw centre than the front end 5. To each oblique face 3 is applied a hard metal alloy fusion deposit 6 of triangular shape to complete the tooth profile. Both the front face 7 and the top face 8 of the triangular cutting tip thus formed constitute the whole thickness of the complete tooth and extend a substantial distance from the transverse cutting edge at the tip 9 of the tooth. Either or both of these faces may be readily ground in the initial finishing of the saw and in re-grinding. The stubs 2 are set to each side of the body 1 across the lines 10, and the side faces of the cutting tips 6 continue flush with the faces of the stubs (Figure 3). The obliquity of the faces 3 enables each stub 2 to provide a thrust generally in the direction of the arrows 11 to support the deposited cutting tips 6.

In Figure 4, the stubs 2A projecting from the periphery of the circular body 1A are not set as in Figure 3; the cutting tips 6A are formed out of the plane of the body so that the set to each side of the body commences substantially at the faces 3A where the cutting tips and the stubs 2A are joined.

In Figure 5, a cutting tip 6B projects to both sides beyond the side planes of a circular body 1B, the side faces 12 of the tip 6B and the stub 2B to which it is joined being finished by hollow grinding, so that the thickness at the top face 8B is greater than the thickness of the body 1B. The side faces of the tip 6B may be relieved behind its front face.

Figure 6 shows complete and generally triangular teeth 13 fusion-deposited on the periphery 14 of a circular body 15, the whole thickness of the front and top faces 16, 17 being constituted by the hard metal alloy. These teeth may be set, e.g. as in Figure 3, or hollow ground, e.g. as in Figure 5.

Figure 7 shows teeth 18 formed by final shaping of a hard metal alloy deposit 19 formed continuously round the periphery 20 of a circular body 21. The teeth 18 may be hollow ground, as in Figure 5, or they may be individually set by grinding.

Instead of both side faces of each tooth following the angle of set, successive teeth 22A, 22B (Figure 8) may have their outer faces 23A, 23B set by individual grinding or by hollow grinding outwards from the respective face of the body 24, the other faces 25A, 25B being respectively flush with the other face of the body.

Figures 9 and 10 show a portion of a straight saw blade 26 (e.g. a band saw or a long saw) with teeth having cutting tips 27 joined to stubs 28 generally in the manner described with reference to Figures 1 and 2. Figure 11 shows complete teeth 29 fusion-deposited along one edge 30 of a straight blade 31, generally as described with reference to Figure 6; and Figure 12 shows teeth 32 formed by final shaping of a hard metal alloy deposit 33 formed continuously along one edge 34 of a straight blade 35, generally as described with reference to Figure 7.

The teeth of the saws of Figures 9 to 12 may be set in similar manner to Figures 3, 4 or 8, or they may have tips wider than the thickness of the blades, with the teeth tapering to the thickness of the blade, as in Figure 5, the teethe being side-relieved behind their front faces if desired.

Instead of hard metal alloy for the teeth of the saws as described with reference to Figures 9 to 12, tungsten carbide or other "hard metal" may be used.

What we claim is:—

1. A saw having some at least of its teeth provided with a substantially triangular cutting tip formed by "hard metal" such as tungsten carbide or substantially non-ferrous hard metal alloy of metals such as cobalt, chromium, and tungsten, as a fusion-deposit applied by welding to the steel body of the saw, the "hard metal" or hard metal alloy constituting the whole thickness of the tooth for a substantial distance along both the front face and the top face of the tooth from its tip.

2. A saw as in Claim 1, wherein each substantially triangular cutting tip is joined to a stub of the steel body material.

3. A saw as in Claim 2, wherein junction is at an oblique thrust face of the stub.

4. A saw as in Claim 1, wherein each fusion-deposited cutting tip of hard metal forms the whole of the tooth projecting from the steel body.

5. A saw as in Claim 1, wherein the teeth are formed from a continuous deposit of "hard metal" or hard metal alloy on the steel body.

6. A saw as in any of Claims 1 to 5, wherein the cutting tips are finished to equal the thickness of the body and are set to opposite sides of the body.

7. A saw as in any of Claims 1 to 5, wherein each of the teeth projects to one or both sides beyond the side plane or planes of the body and is finished to make the overall thickness at the tooth tip greater than the body thickness.

8. A saw as in Claim 7, wherein the cutting tips are side-relieved.

9. A circular saw having teeth formed of or tipped with "hard metal" or hard metal alloy as in any of Claims 1 to 8.

10 A band saw or long saw having teeth formed of or tipped with "hard metal" or hard metal alloy as in any of Claims 1 to 8.

11. Circular and other saws with teeth of "hard metal" or hard metal alloy substantially as hereinbefore described with reference to the accompanying drawings.

HULSE & WAITE.
Chartered Patent Agents,
269 Glossop Road,
Sheffield 10.

PROVISIONAL SPECIFICATION.

Improvements in or relating to Circular Saws.

We, ELSWORTH LIMITED, a British Company, of Herries Road South, Sheffield 6, do hereby declare this invention to be described in the following statement:—

This invention relates to circular saws of the type in which the cutting edges proper of the teeth are provided by hard metal bonded to the steel body material.

It is known to form recesses in the front face, or the top (rear) face, or in one or both of the side faces, of some or all of the teeth of a circular saw, and to fill the recesses with an insert of hard metal, such as pre-formed sintered compact of tungsten carbide brazed or welded into position, or a fusion-deposit of a substantially non-ferrous alloy of metals such as cobalt, chromium, and tungsten. In such saws, the steel body as initially prepared to receive the inserts is toothed at its periphery much as a homogeneous tool steel body is toothed, with the teeth to receive the inserts being only slightly modified in shape on one or other of their faces to be filled by the inserts, so that the body of the tooth extends into or close to the cutting face provided by the insert in that tooth.

The object of the present invention is to provide a saw with teeth having hard metal providing the whole of the cutting edges in both the front and top (rear) faces of the teeth.

According to the present invention, a circular saw has some at least of its teeth provided by substantially triangular hard metal inserts applied by fusion-deposition to the steel body of the saw, the whole thickness of each such tooth being constituted by the hard metal and two side faces of the triangular insert extending substantially along both the front and top faces of the tooth from its tip.

The invention is applicable to circular saws having a very wide variety of sizes and shapes of teeth, in accordance with the purpose to which any particular saw is to be put likewise, the hard metal may be any of a wide number of types, in accordance with the purpose of the saw.

The third face (not necessarily straight) of the "triangle" may occupy such position intermediately of the tip radius and the root radius as to leave a sufficient stub of steel body material completing the remainder of the tooth for setting of the tooth by deformation of the stub. The rear end of the third face is advantageously farther from the centre of the saw than is the front end, so as better to transmit the thrust on the triangular insert to the stub of the tooth. The insert may be finished to equal in thickness the thickness of the body, so that when the saw is set it closely resembles a similarly set saw made wholly of tool steel.

Such a saw as just described, and having its fusion-deposited inserts of a hard metal alloy, is particularly useful for sawing woods of intermediate hardness and woods from sources likely to introduce sand into them, because it not only has a long total life, but may also be readily re-ground by the methods employed for tool-steel saws by users of such woods. It is much less expensive than a saw having pre-formed sintered compact inserts, which moreover, do not lend themselves to re-grinding by methods ordinarily available to such users.

It is not essential to provide the set on the saw by deformation of the stub of the tooth: the insert may be finished to shape out of the plane of the body to provide the set, for example with alternate teeth set to opposite sides of the body. Again, the insert may project to one or both sides beyond the side plane or planes of the body and be finished by "hollow grinding" the side or sides of the teeth and the sides of the body to make the overall peripheral thickness at the tooth tips greater than the body thickness. Moreover, tooth inserts projecting beyond a side plane of the body may be side-relieved, e.g. when the saw is used for grooving.

The body is formed with only the stubs projecting at its periphery, ready for the deposition of the inserts on the outer faces of the stubs forming the bonding surfaces.

The fusion-deposited insert may even form the whole of a tooth, the bonding surfaces then being at the periphery of a simple circular body. The whole-tooth insert may then be shaped to give the set, or hollow-ground with the body, as described above. This form of tooth is particularly suitable for relatively finely toothed saws.

As an extension of this whole-tooth bonding of a fusion deposited insert, fine teeth may be applied by depositing the hard metal continuously round the complete periphery of the steel body, and subsequently forming the toothed profile in the deposit. The initial radial dimension of the deposit should be greater than the tooth depth, to allow for repeated re-grinding. In this case, hollow-grinding is preferred to make the overall tip thickness greater than the body thickness; but setting of the teeth by grinding their side faces individually may also be adopted.

Although for softwoods and medium hardwoods, hard metal alloys suffice for the teeth of saws as required by the generality of users, with the advantages in prime cost and ease of grinding mentioned above, the teeth may also be formed by fusion-deposition of tungsten carbide or like hard particles in a ferrous matrix, to be initially shaped and subsequently re-ground by the use of appropriately hard abrasives, saws having such teeth operating successfully on harder and more difficult timbers, as well as on plastics and plastic-bonded laminated material.

The fusion-deposition may be effected by acetylene welding or by electro-welding, as appropriate for the hard materials required to be deposited.

HULSE & WAITE.
Chartered Patent Agents,
269 Glossop Road,
Sheffield 10.

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FIG. 1.

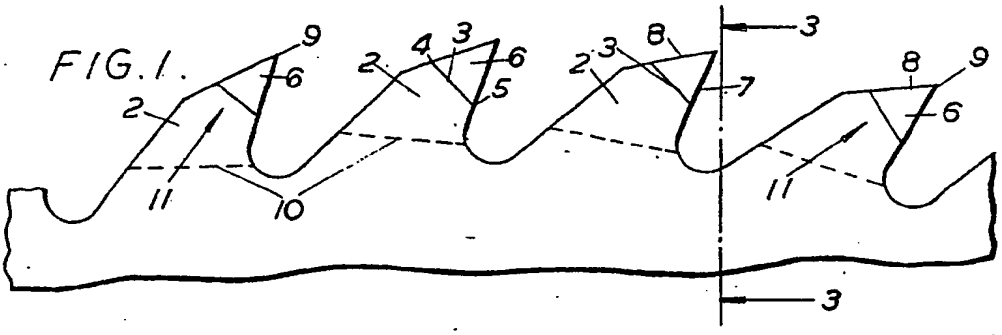


FIG. 2.

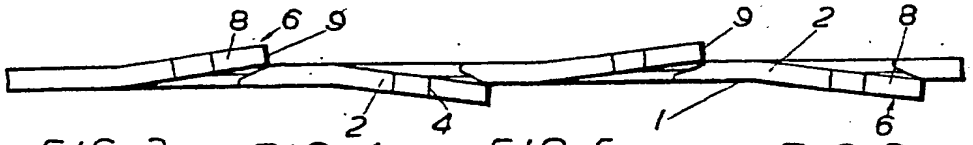


FIG. 3.

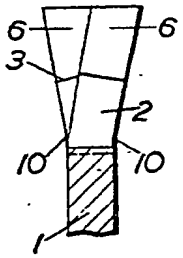


FIG. 4.

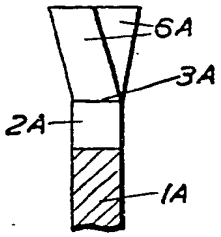


FIG. 5.

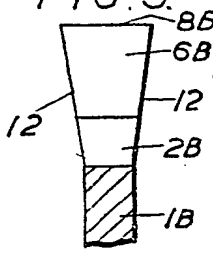


FIG. 8.

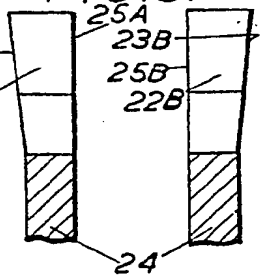


FIG. 6.

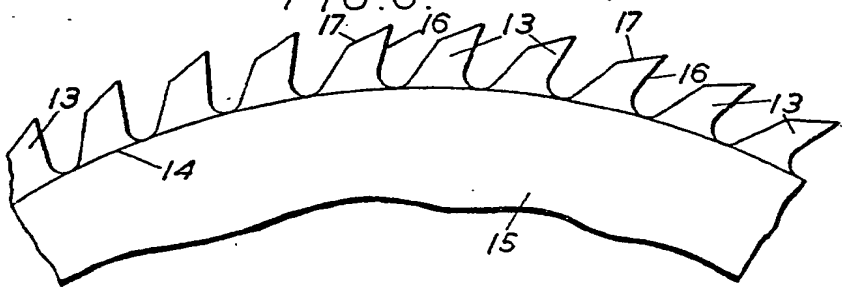
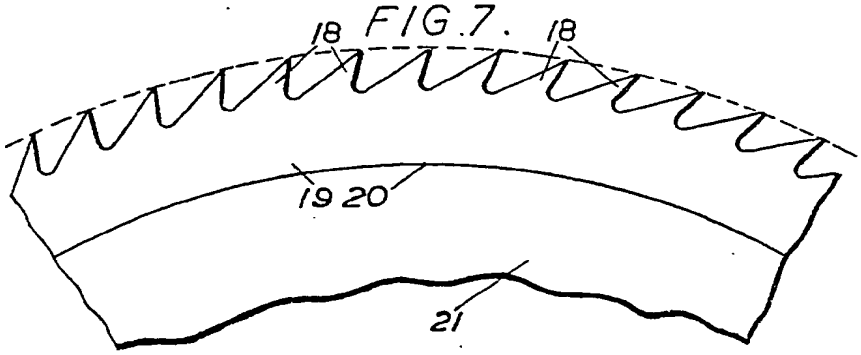


FIG. 7.



741,186 COMPLETE SPECIFICATION

2 SHEETS

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SHEETS 1 & 2

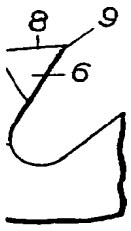
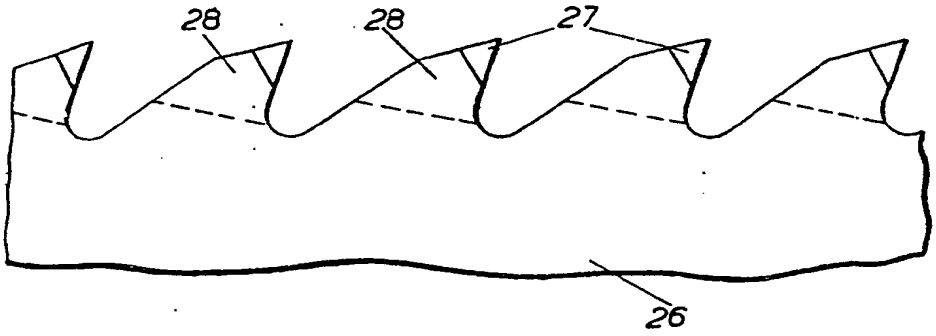
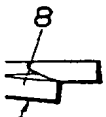


FIG.9.





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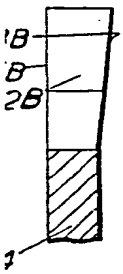


FIG.10.

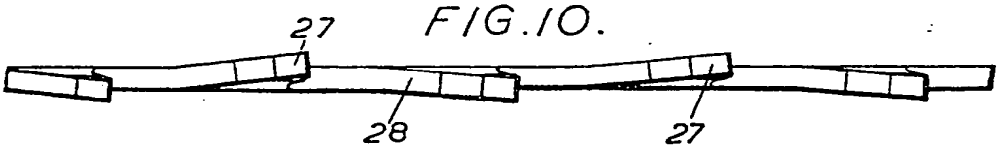


FIG.11.

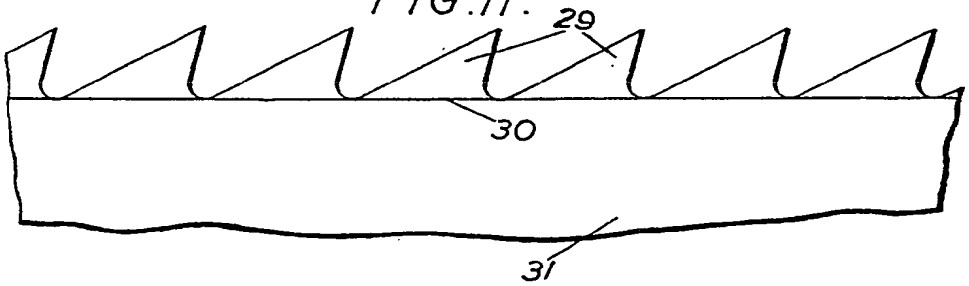
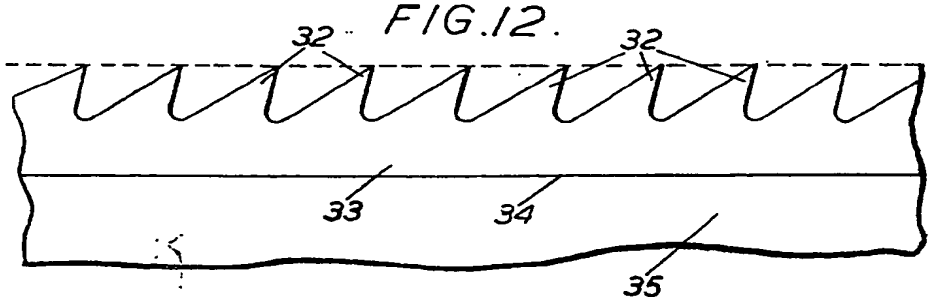


FIG.12.



741,186 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

FIG.1.

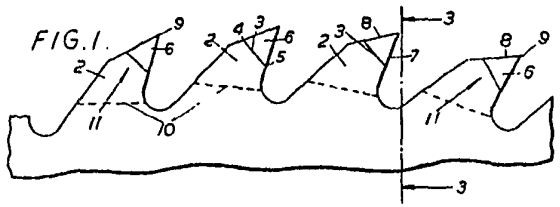


FIG.2.

FIG.3.

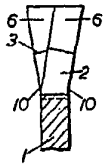


FIG.4.

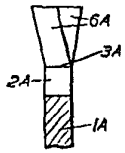


FIG.5.

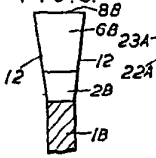


FIG.8.

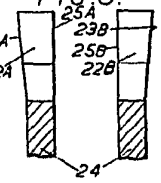


FIG.6.

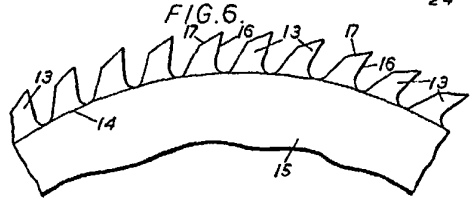


FIG.7.

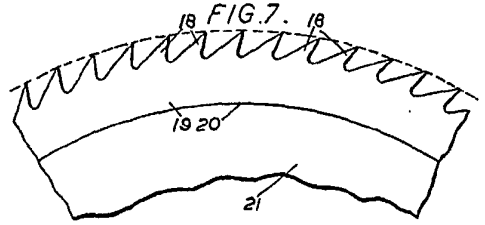


FIG.9.

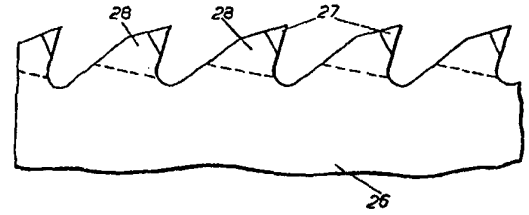


FIG.10.

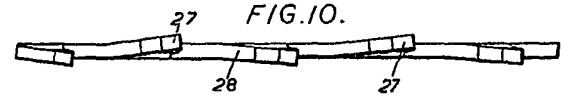


FIG.11.

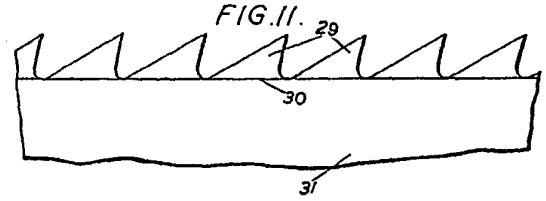


FIG.12.